tration. It was found impossible to remove the growth in its entirety, and only about one-half was taken out. It proved to be a spindle-cell sarcoma. Since the operation, which was performed in May, 1894, (nearly a year ago), the improvement in the boy's condition has been very striking. For nearly six months after the operation he had no epileptic attacks at all; the pain and headache disappeared, as did also the optic neuritis. His left arm has regained considerable power, and he is able to move the fingers to some extent. During the past five months he has had about one epileptic attack each month, the movements being confined to the paralyzed side; they are not accompanied by loss of consciousness nor the severe pain he formerly had. Between the attacks he is perfectly well. Of course, the ultimate prognosis of the case is unfavorable, but the boy has had a year of comparative comfort and usefulness, and at present his condition is not growing worse. After the operation he was placed on arsenic, which was continued in moderate doses last summer. He has also taken some bromides. It appeared that the tumor developed from the dura.

In conclusion, Dr. Dana said that at a meeting of the Society last fall he referred to this case and gave the results of a careful study of the cutaneous disturbances. Immediately after the operation, the sensory disturbances seemed to be temporarily aggravated. At the present time there is only apparent a disturbance in the power of localization.

DR. SACHS—In regard to the patient shown by Dr. Dana, the speaker said he has seen several cases in which the excision of cortical substance for epilepsy, cyst or tumor resulted in sensory disturbances which were recovered from within a few days—much more rapidly than from the motor symptoms. The speaker also regarded Dr. Dana's case as one of the most succesful among those reported after the removal of a cortical tumor.

Dr. W. H. THOMSON read a paper, entitled

RELATIONS OF THE CEREBRAL CORTEX TO SENSATION (see page 333).

Dr. B. SACHS said he was a little surprised at the turn which Dr. Thomson's paper had taken. From the title of the paper he was led to expect that it would deal with the question of whether or not there were true sensory areas in the brain cortex, and whether those areas overlapped or were entirely distinct from one another. Still, the paper brought up a number of interesting questions which are well worthy of discussion. It appeared to him that Dr. Thomson attached too much importance to the experiments that have been performed on the lower animals. The analogy between the lower animals and man should not be drawn too closely. There is a great difference between a dog and man: the former may be able to accomplish much without his cerebrum, while the latter can do very little if he is deprived of relatively large portion of it. In his paper, the author has invariably referred to sensory stimulation, or to a simple sensory impression as sensation, which is after all different from true sensation, into which the element of consciousness enters. Sensation, as applied to human beings, is not merely perception, but apperception.

Dr. Thomson seems to believe that epileptic seizures can occur without a cortex. This was disproven some years ago by Binswanger, who distinctly showed that while general tetanic contractions might occur in the body with lesions in the medulla or even below that level, orderly convulsive seizures never occur unless there is disease or irritation of the cortex.

Everyone is willing to admit that the brain of a child is a blank until sensory impressions are received, and that motor functions are the result of these. It is probable that we must sooner or later modify the conceptions we now entertain as regards cortical areas and their limitations. While the size of a certain area is, of course, of some importance, the immense number of cells present in each area must be taken into consideration. In the motor area for speech, for instance, sufficient number of cells are present to accommodate the wants of the poorest speaker and the most fluent orator, the latter simply taking possession of so many more cells.

The speaker expressed his conviction that the motor and sensory areas in the cortex overlap to a certain extent. He is willing to suppose that all the motor centres were primarily sensory, and that there is an actual representation of various kinds of sensation in the cortex. Dr. Thomson is probably correct in the assertion that the cortical centres are not as strictly limited as we suppose, but in the main we should base our deductions upon the experimental physiology that has been conducted through the surgeon's work in this field, and be guided by those results.

Dr. C. L. DANA said he would confine himself to a statement of what he considered to be the facts in regard to the localization of sensations. He looked upon a sensation as the earliest and simplest of the conscious states. If the end of the finger is touched by some object, we get a sensation of contact. If a white light is thrown into the eyes, we get a simple sensation of light. When the contact is felt to be rough and cold, and association and memory are brought into play then we get concepts. If we attempt to make the term sensation mean anything more than that indicated we are thrown at once into great confusion. The speaker believed that simple sensations of touch, smell, sight, hearing, etc., were well differentiated and localized in the brain cortex, nor did he believe there were any truly conscious states in man except in connection with the activity of the cerebral cortex. If we shave off the motor cortex on both sides of the human brain, we produce cutaneous anæsthesia, and then no kind of contact will arouse any sensation of a cutaneous character. We might get reflex acts, but they would not indicate that any sensation was present. The same doctrine probably holds true regarding the special senses of sight, smell, taste and hearing.

In connection with this subject the following case is of interest: A child was born at Bellevue Hospital and lived for five days, during which time it cried when it was hungry or when it was pinched or roughly handled; it winked its eyes and showed certain manifestations of apparent intelligence. At the autopsy it was found that the cerebral hemispheres were absent; there were merely small fragments of the corpora striata and imperfect optic thalami. In that instance there were probably no genuine sensory impulses; the impulses were simply excito-reflex in character. Sensations, carefully defined and understood, and rigidly separated, will probably be found to be conscious units which are localized in different parts of the cortical area. As regards the point brought out by Dr. Thomson that motor cells never explode or discharge themselves without being first "touched off" by an afferent impulse, the speaker said he was quite ready to believe that that was possible, or even always the case.

Dr. W. R. PRITCHARD said that he expected from the title of Dr. Thomson's paper that it would deal with the question of cortical representation of common sensations; he had no idea it would take the psycho-physiological turn it did. Personally, he believes in the doctrine of cortical representation for common sensations, and furthermore, that the cortical regions in which these sensations are represented, correspond very closely with what is known as the motor area. He had hoped that in the discussion some reference would be made to other sensory functions which are not included under the term of common sensations, but are more particularly related to the viscera, the heart, lungs, stomach, etc. These sensations have been variously styled automatic or reflex in character, but he is of the opinion that they are distinct, conscious impressions, just as much so as are the sensations of touch, temperature, etc. He has collected certain facts touching on this subject which he expects shortly to bring out in a paper, which facts are suggestively confirmatory of a theory of cortical or at least cerebral, representation and definite localization of these sub-divisions of sensation.

Dr. JOSEPH COLLINS said that to his mind, the facts brought forward by Goltz and others who have experimented on the lower animal were not inimical to the contentions held by those who believe in the localization theory. The movements of those animals, such as balancing, coordination, maintenance of equilibrium, and even the remarkable efforts of prehension and apparently purposive movements, can be explained on purely physiological grounds, and do not have to be taken higher up into the realm of the sensorium than the medulla or perhaps one plane higher; at least caudad to the internal capsule. He inquired of Dr. Thomson how he reconciled his conception of the primary and secondary neuron with his position in regard to the non-necessity of anything higher than the spinal cord for the possession or maintenance of the sensory and motor function, sensations, etc., as referred to in his paper. In that case, what functions does the primary neuron perform? Dr. Thomson attributes to the secondary neuron all the important phenomena which are ordinarily attributed to the cortical structure and its ramifications.

In regard to the concluding portion of the paper, Dr. Collins said he did not think that in epilepsy there is a surcharge of energy in the cortical cells, which explodes, but on the contrary, on account of their pathological condition the cells are unable to retain securely an amount of energy which they are able to hold in their physiological condition. That is, they lose their tenacity and an explosion results.

Dr. E. D. FISHER.—The great difficulty in discussing this subject is to fully understand the difference between direct afferent impressions and true sensation. When we speak of sensation ordinarily, we mean the perception or appreciation of a certain thing by the person or animal. I believe that animals have true sensations; the dog is not only able to appreciate pain, but he is also able to appreciate comfort and discomfort. The sensation of pain must be received somewhere in the cortex; just how definite its localization is, it is difficult to say. It seems to be necessary that the sensation come from the external portion of the body, for, if we irritate the cortex itself, it does not give rise to pain. In its efferent or motor aspect, however, the cortex responds, whether the irritation comes from without or within. A scar on the finger may give rise to an epileptic seizure, beginning in that finger; a similar attack may be induced by irritating the brain centre governing that region of the body.

Dr. THOMSON.—I apologize for having misled the gentlemen who took part in the discussion by the title of my paper; my idea in bringing up the subject as I did was to simplify it. If we begin at the cortex, we are confronted with the most complicated end of the problem; it, therefore, occured to me to begin from below, going up towards the cortex, and then determine whether such a thing as sensation could properly be said to be found before we reached the cortex.

I agree with Dr. Sachs that we must be careful about interpreting facts observed in the lower animals, and applying the deductions to man; but when it is a mere question of intelligence, I see no reason why an analogy should not be drawn between dogs and man. Many dogs seem to possess more intelligence than monkeys, and the latter are supposed to be very closely related to man. The results of Goltz's experiments are certainly very remarkable.